GB 002190356 A
NOV 1987

(12) UK Patent Application (19) GB (11) 2 190 356 (13) A

(43) Application published 18 Nov 1987

(21) Application No **8707766**

(22) Date of filing **1 Apr 1987**

(30) Priority data
(31) **861892** (32) **6 May 1986** (33) **FI**

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(51) INT CL⁴
B66B 5/22

(52) Domestic classification (Edition I):
B8L 8B 8E 8G 8X

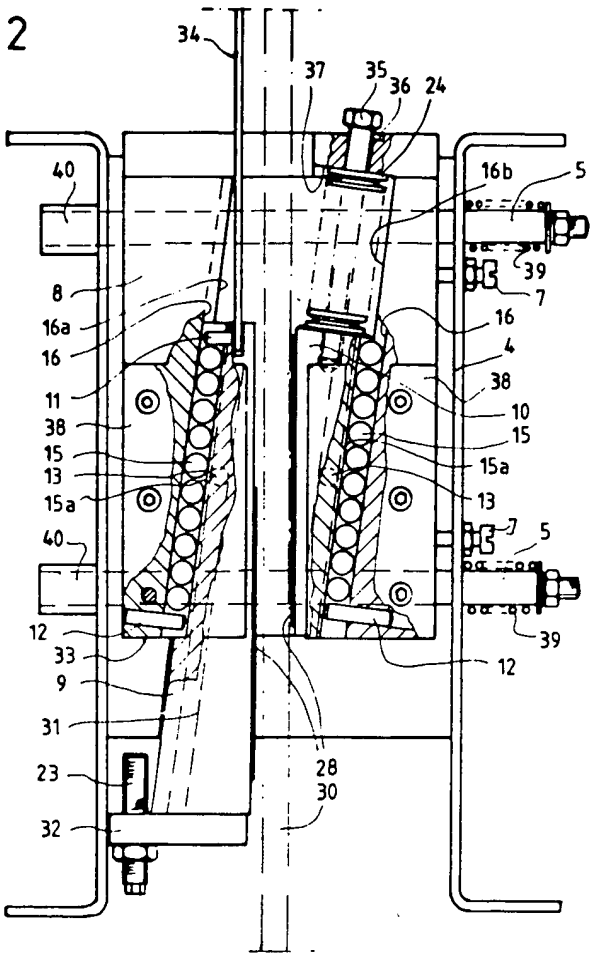
(56) Documents cited
None

(58) Field of search
B8L
Selected US specifications from IPC sub-class B66B

(54) Catch device, for instance for a lift cage or counterweight

(57) The invention concerns a catch device e.g. for a lift cage or counterweight, said catch device comprising a wedge case (8), an action wedge (9) acting from one side on the lift guide (30) and activated by a separate transmission member, such as a rope (34), and a counterwedge (10) acting on the lift guide from the opposite side. The movement of the wedges has been directed to pass along inclined guiding surfaces (16a and 16b), the distance between their top margins being equal to or larger than the distance between their lower margins. The angle of inclination of the guiding surfaces (16a and 16b) is the same as the wedge angle (α) of the respective wedge (9,10). Furthermore, the wedge case (8) comprises a force member (24), such as a spring, which causes a force substantially parallel to the guiding surface (16b) on the counterwedge (10).

Fig.2



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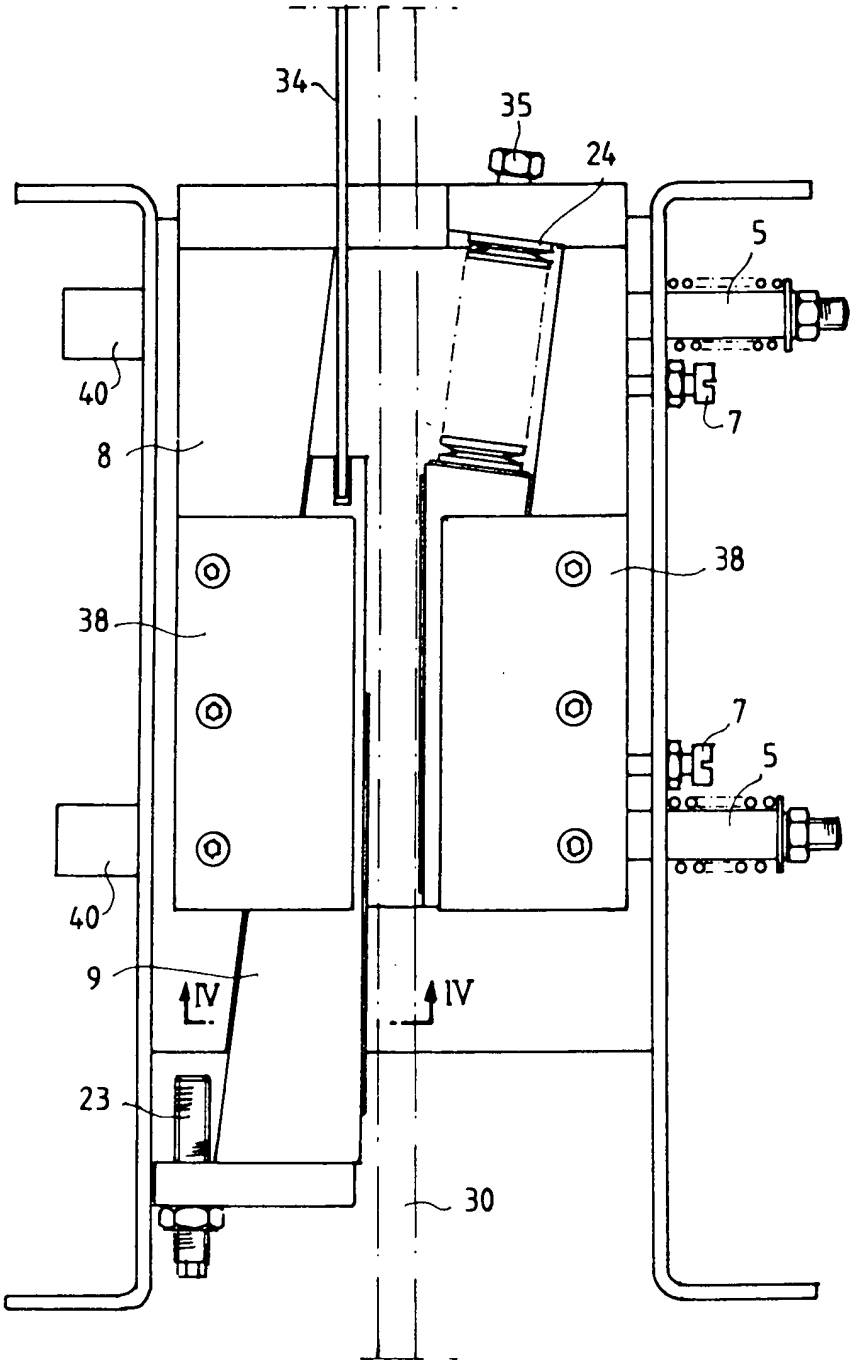

Fig.1

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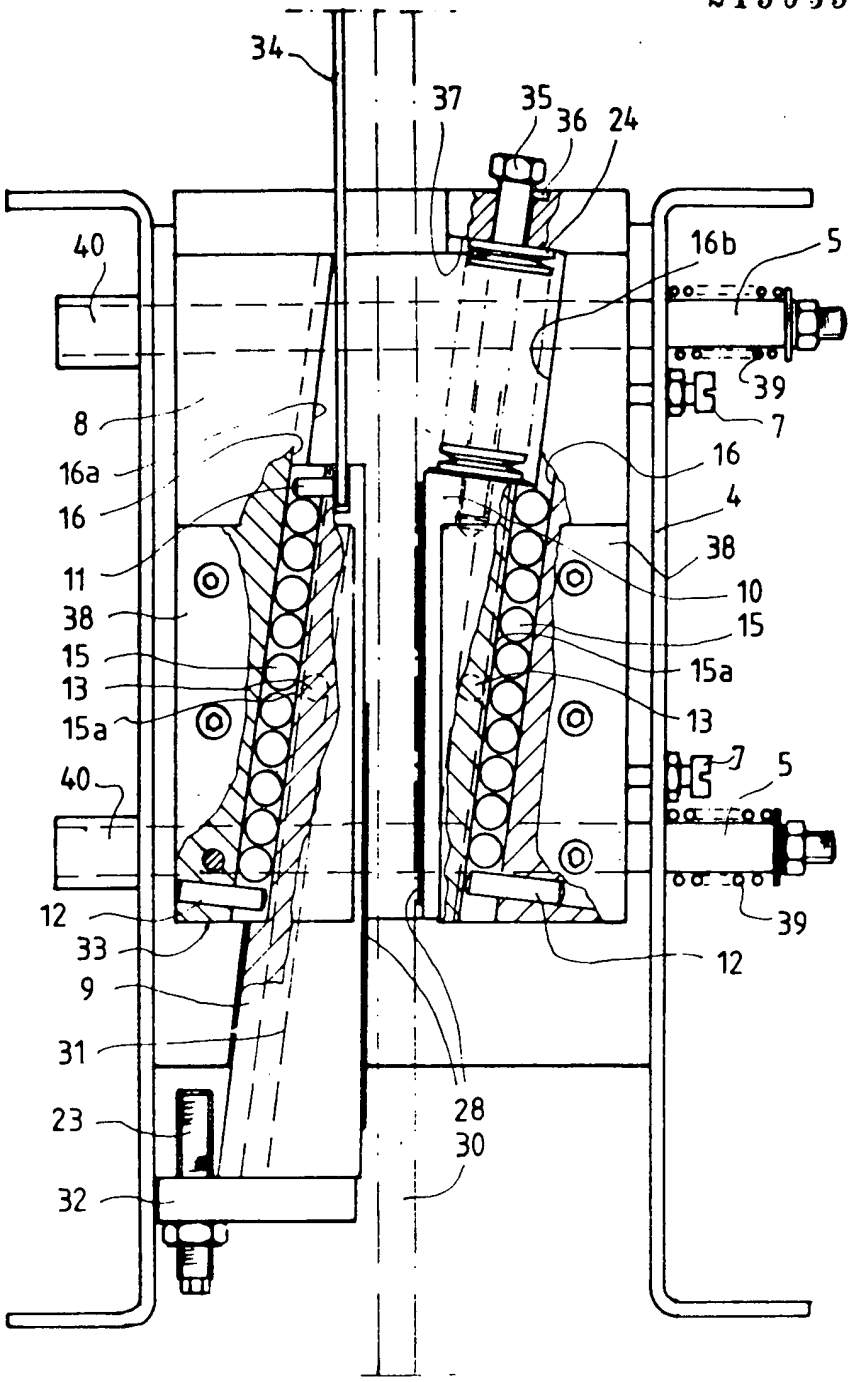

Fig.2

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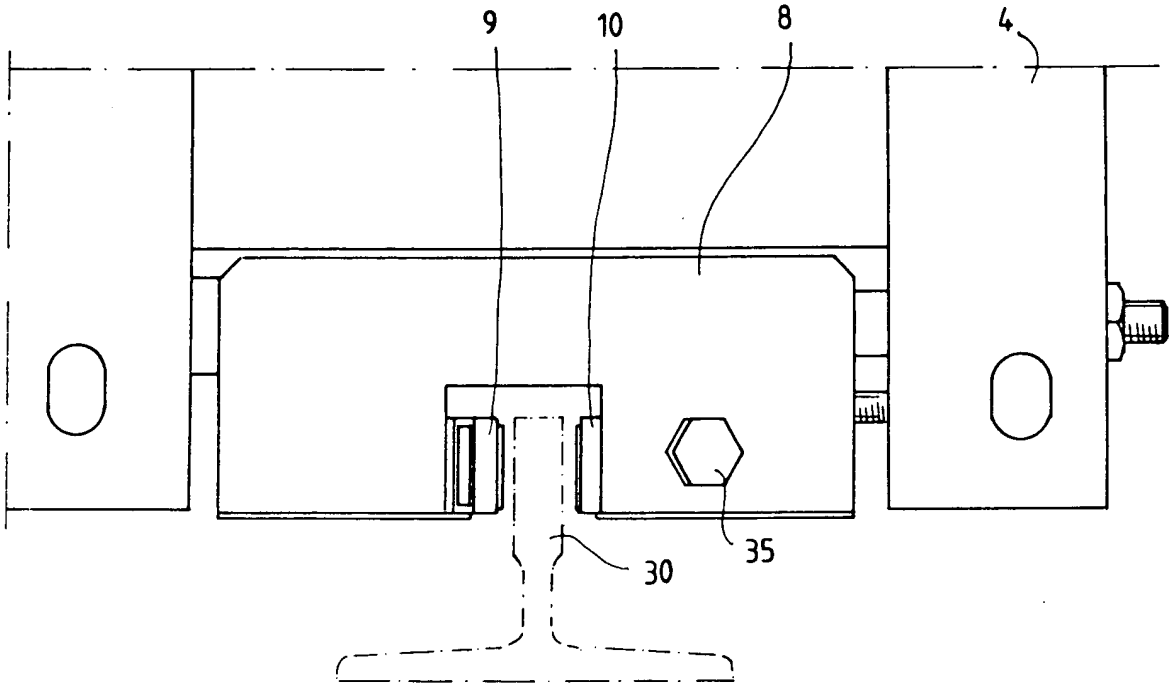

Fig. 3

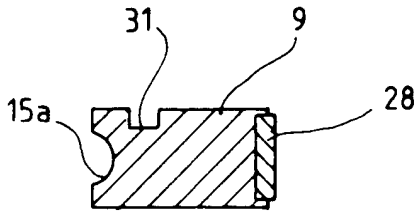

Fig. 4

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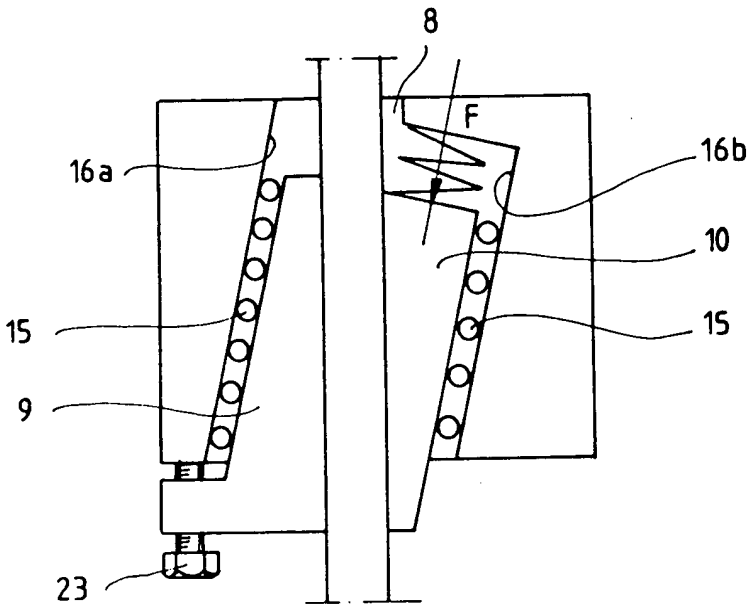

Fig.5

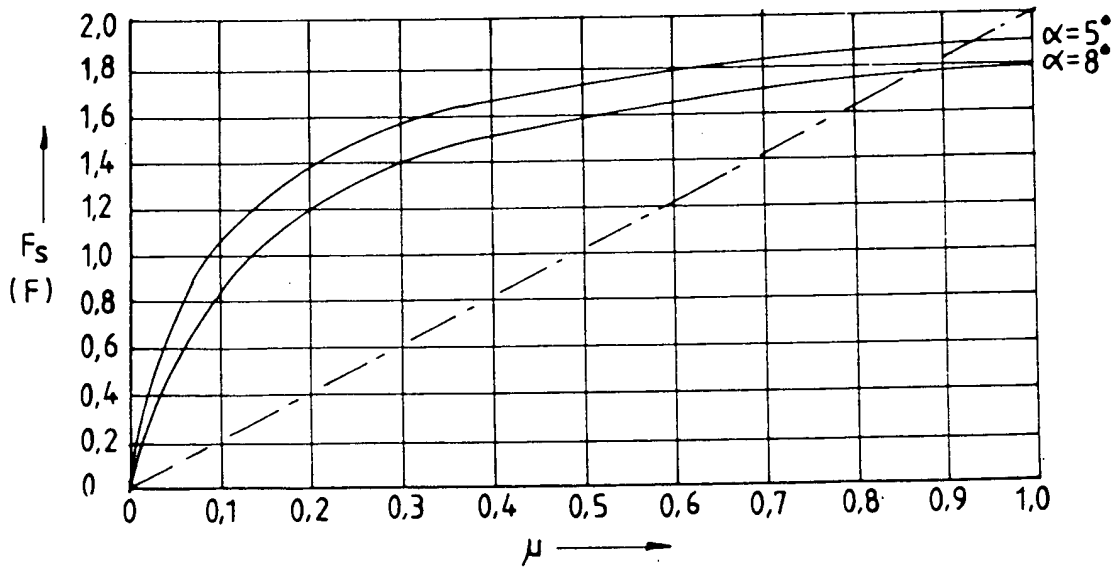

Fig.6

SPECIFICATION

Catch device, for instance for a lift cage or counterweight

The present invention concerns a catch device e.g. for a lift cage or counterweight, said catch device comprising a wedge case, an action wedge acting from one side on the lift guide and which is activated by means of a separate trnasmission member, such as a rope, and a counterwedge acting on the lift guide from the opposite side, the movement of said wedges being guided to go directly or indirectly along guiding surfaces in the wedge case.

On lifts with a cage velocity over 1 m/s usually glide catch devices are employed as a safety measure when for one reason or another the velocity of the lift cage increases to be excessively high. Glide catch devices catch on the guides in the lift shaft, which most usually number two or four. When each guide has a glide catch device of its own, the catch devices are synchronized by mediation or a separate synchronizing linkage. The glide catch device has a sliding surface with high friction coefficient, which is urged against the guide when the glide catch device goes into action and slows the lift down, or stops it, with the aid of friction.

Various device designs have been worked out for lift catch devices. One of the commonest types is a large-sized, U-shaped spring made of spring steel, between the ends of which the wedge enters when it catches on the guide. In addition, many catch devices feature a separate detachment wedge, with the aid of which the catch device is disengaged from the guide after catching has occurred. Disengagement is effected by lifting the lift cage.

The greatest drawback of catch devices of prior art is their high price and large size. The high price is due, among other things, to the circumstance that, for instance, the springs which are used are not standardized parts. A further drawback of previously known catch devices is a result of the variations of force occurring in connection with the catching action, because the value of the friction coefficient is different at different points along the guide, depending e.g. on the surface quality of the guide, the temperature of the friction material that is used, and the velocity of the lift cage.

The object of the present invention is to provide a glide catch device for lifts in which the drawbacks mentioned above have been eliminated and with the aid of which also several other advantages are gained over existing catch devices. The catch device of the invention is characterized in that the wedge case comprises a force member which produces a force substantially parallel to the guiding surface, acting on the counterwedge.

The catch device according to an advantageous embodiment of the invention is characterized in that the guiding surface of the counterwedge has been so inclined that the distance from the upper margin of the guiding surface to the lift guide is larger than the corresponding distance from the lower margin of the same guiding surface.

The catch device according to another advantageous embodiment of the invention is characterized in that the distance between the upper margins of the guiding surfaces equals or is larger than the distance between the corresponding lower margins of the guiding surfaces, and that the angle of inclination is the same as the wedge angle of the corresponding wedge.

The catch device according to a third advantageous embodiment of the invention is characterized in that the distance between the upper margins of the guiding surfaces is smaller than the distance between the corresponding lower margins of the guiding surfaces.

The catch device according to a further advantageous embodiment of the invention is characterized in that the element in the force member causing the force is a spring.

Among the advantages common to the catch device according to the above-mentioned embodiments over catch devices of prior art, it may be mentioned that in the catch device of the invention in the normal operating range inexpensive standard springs can be used, which moreover have less power than presently used springs. Furthermore, the catch device of the invention affords the advantage that variations of friction coefficient at different points along the guides have no equally great effect on the attainable friction force as in conventional catch devices. In a way, the catch device is self-regulating.

The catch device of the invention is described in the following in detail, referring to the drawings, wherein:—

Figure 1 presents the catch device of the invention, seen from the front,

Figure 2 presents the same catch device, partly sectioned,

Figure 3 presents further the same catch device, seen from above and partly sectioned,

Figure 4 shows the action wedge, sectioned along the line IV–IV in Fig. 1,

Figure 5 presents further the same catch device, seen from the front and simplified, and

Figure 6 displays graphically the values of the attainable friction force, plotted over the friction coefficient.

The catch device comprises a wedge case 8, which has been fixed in the catch device frame 4 with spring-loaded bolts 5. For lateral adjustment of the wedge case 8, the catch device comprises adjustment screws 7, which are braced against the catch device frame 4. The wedge case 8 is so positioned in relation

faces 28 of the wedges. In Fig. 6 are graphically shown the friction forces found from the above formula for different values of the friction coefficient. Of the calculated results two graphs have been plotted, one represnting the results when the wedge angle is 5° and the other, when the wedge angle is 8°. For comparison, in the same connection has been plotted, with dot-and-dash lines, the friction force obtainable with a catch device according to the state of art, over the friction coefficient. The spring force is then usually parallel to the normal force, i.e., perpendicular against the lift guide. It is clearly seen from the graphs that with friction coefficient values below 0.85 clearly higher friction against the braking surface is achieved with the catch device of the invention than with conventional catch devices. Correspondingly, friction coefficients higher than 0.85 are exceedingly difficult to attain. From the foregoing follows inversely that with the catch device of the invention and using a spring of lower effect equal friction forces are obtained as with conventional catch devices and using powerful, large springs. Fig. 6 also reveals the independence, better than in the case of conventional catch devices, of the catch device of the invention of variations in friction coefficient between different points on the lift guide. The variation of friction coefficient is influenced by the surface quality of the lift guide at different points, the temperature of the friction material that is used, the velocity of the lift cage, etc. Let us assume that with the materials at our disposal a nominal friction coefficient of $\mu=0.5$ is obtained between the lift guide and the braking surfaces of the wedges, and that the variation of the friction coefficient owing to various factors is $\pm 25\%$. The maximum of the friction coefficient is then 0.3125 and the minimum, 0.1875. We can read from the graphs in Fig. 6 that with conventional catch devices the friction force $F_s=0.5 * F$ is obtained, where thus F stands for the spring force.

Similarly we find for the maximum of the friction force 0.625 * F and for the minimum, 0.375 * F. From these figures we can calculate that the variation of friction force is the same as that of the friction coefficient, i.e., $\pm 25\%$ of the nominal friction force. In the case of the catch device of the invention, calculation with the same values of friction coefficient and of variation yields the following values, on assumption that the wedge angle is 8°: nominal friction force 1.2929 * F, maximum friction force 1.3931 * F, and minimum friction force 1.544 * F. Hereby the variations of friction force, related to nominal friction force, are -10.7% and $+7.8\%$. Thus we may note that when the catch device of the invention is used, the variation of braking force in the event of catching is substantially less than that encountered when conventional catch devices are used. The consequence is better, and more reliable, catching than with catch devices conforming to the state of art.

It is obvious to a person skilled in the art that the invention is not exclusively confined to the example presented in the foregoing and that, instead, different embodiments of the invention may vary within the scope of the claims stated below.

CLAIMS

1. A catch device e.g. for a lift cage or counterweight, said catch device comprising a wedge case (8), an action wedge (9) acting from one side on the lift guide and activated by a separate transmission member, such as a rope, and a counterwedge (10) acting on the lift guide from the opposite side, the movement of said wedges having been directed to pass directly or indirectly along guiding surfaces (16a and 16b) provided in the wedge case (8), characterized in that in the wedge case (8) comprises a force member (24) which causes a force substantially parallel to the guiding surface (16b) on the counterwedge (10).

2. Catch device according to claim 1, characterized in that the guiding surface of the counterwedge (10) is so inclined that the distance between the top margin of the guiding surface (16b) and the lift guide is greater than the equivalent distance at the lower margin of the same guiding surface.

3. Catch device according to claim 1 or 2, characterized in that the distance between the top margins of the guiding surfaces (16a and 16b) equals or is larger than the distance between the lower margins of respective guiding surfaces, and that the angle of inclination (α) of the guiding surfaces (16a and 16b) is the same as the wedge angle of the respective wedge (9,10).

4. Catch device according to claim 1 or 2, characterized in that the distance between the top margins of the guiding surfaces (16a and 16b) is less than the distance between the lower margins of respective guiding surfaces.

5. Catch device according to any one of the precedings claims, characterized in that in the force member (24) the element producing the force is a spring.

6. A catch device as claimed in Claim 1, substantially as described with reference to Figs. 1–5 of the accompanying drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd, Dd 8991685, 1987.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.